Refractor
Model:BR-7

Operation Manual

<Important>
Read this manual thoroughly before use.
Keep this manual on hand at all times.

SHIN-NIPPON

I-050707

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I-050707

CONTENTS

1. Specification

(1) Model: REFRACTOR BR-7

(2) Measuring range:

Near sight: 0.00 ～ -19D, 0.25D interval

Hypermetropia: 0.00 ～ +16.75D, 0.25D interval

(It is possible to measure at 0.12D interval when using a built-in assistance lens.)

Astigmatic: 0.00 ～ -6.00D, 0.25D interval

(It is possible to measure up to -8.00D when using attachment lens -2D.)

(It is possible to measure at 0.12D interval when using attachment lens 0D.)

(The astigmatic axis is 0 ～ 180 degree, 5 degree interval scale.)

(3) Cross cylinder: +/-0.25D (+/-0.37, +/-0.50D are an option.)

(4) Rotary Prism: 0 ～ 20△, 1△ interval scale

(5) Assistance lens:

R	——— Lens for Retinoscope (S+1.50D)
P	——— Polarization lens
RMV	——— Perpendicular red Maddox (WMV perpendicular white Maddox)
RMH	——— Horizontal red Maddox (WMH level white Maddox)
R side	——— Red filter (Green filter on L side)
+.12	——— Spherical lens +0.12D
PH	——— Pinhole
6△U	——— Separation prism (the frame on L side is 10*I)
+/-.50	——— Fixation cross cylinder
OC	——— Shelter board

(6) Pupil distance: 48 ～ 75mm, 1mm interval scale

(7) Concentration: △-400 mm

(8) Forehead support control: 16mm

(9) Weight: About 4.25 kg

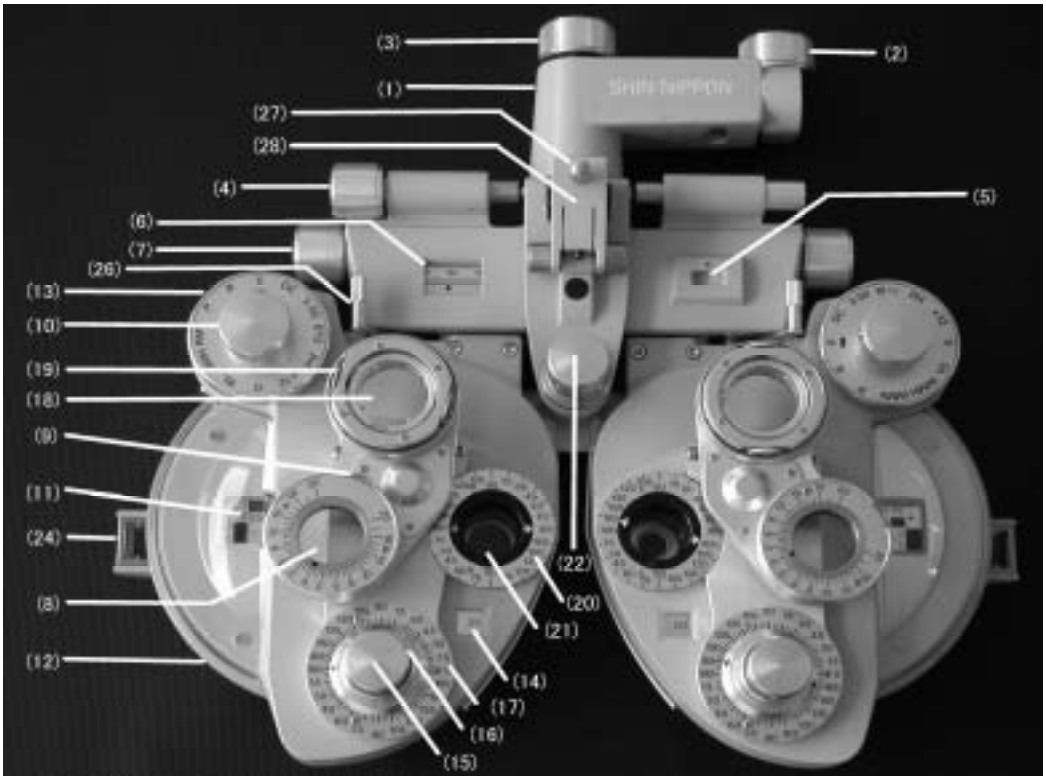
(10) Size: W318 x D293 x H96

(11) Accessories: Near point scale, near point folder
Near point card
Assistance lens (Two C-0.12, two C-2.00)
Vinyl covers for dust protection

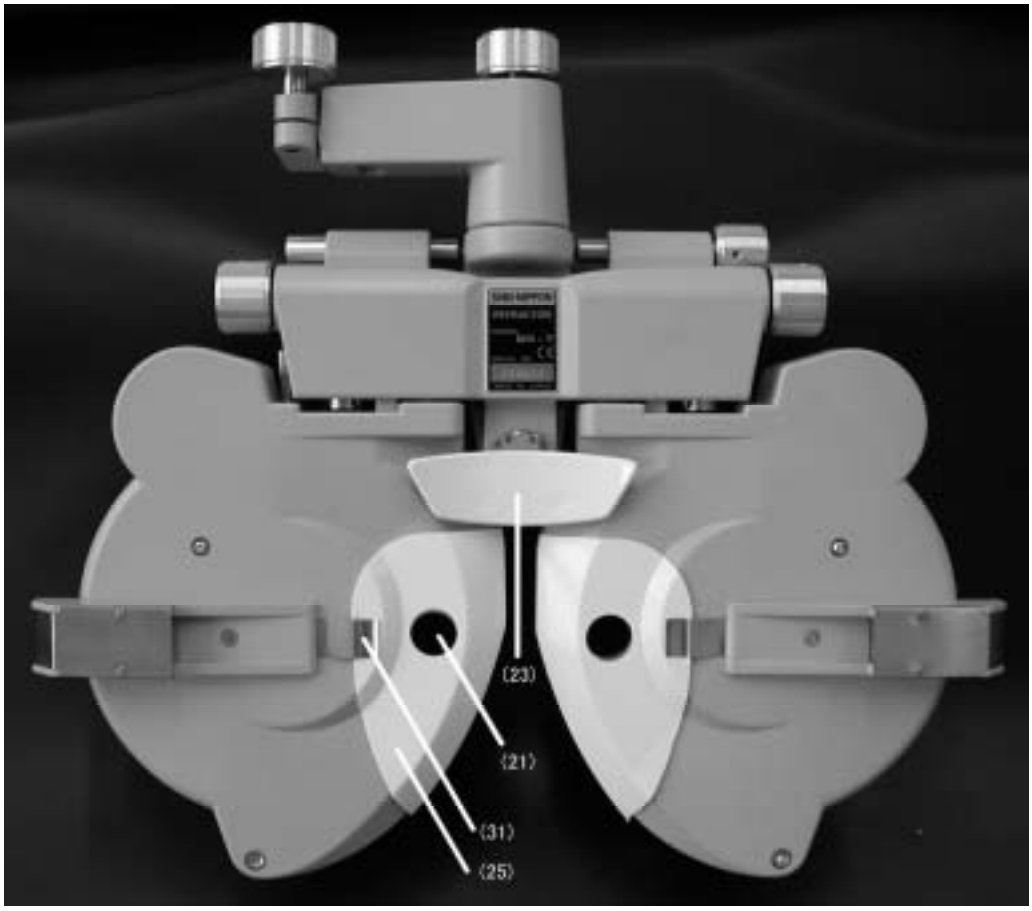
Characteristic of BR-7

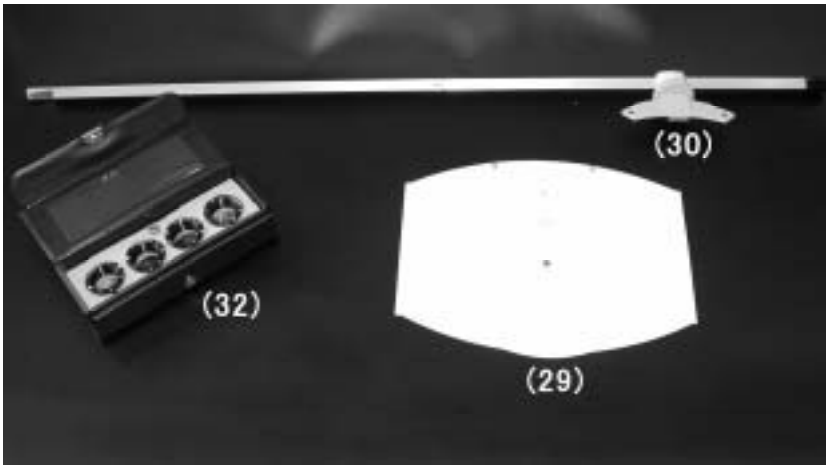
1) Since the cross cylinder and the rotary prism keep a constant distance from the eyes by the double loupe (turret) method, it is possible to do precise measurement and it can be used easily.
2) Since the cross cylinder loupe is automatically connected with the astigmatic axis by the synchronic mechanism, it shows efficiency in the astigmatic precise measurement.
3) It becomes easier to use with front observation and the front operation.
4) The degree display window is big and can be easily read.
5) The combination of the eyesight equipment and the various assistance lens can provide a wide variety of inspection such as eye view function inspections.
6) As for the mechanism of concentration for short distance inspection, all optical mechanisms are set correctly by the lever operation.

2. Exterior Features (See Figure 1)



(1) Attachment mounts to the unit
(2) Fixed knob for the mount
(3) Rotation knob: Used to rotate the direction of the main body.
(4) Horizontal control knob: Used for horizontal adjustment of the main body.
(5) Level vial: Used as a target of adjusting the leveling.
(6) PD scale: Displays a distance among the pupils.
(7) PD knob: Used to adjust distance among pupils.
(8) Rotating prism: Enables to inspect inclination and to test eye balance.
(9) Prism revolving knob: Used to adjust the prism degree.
(10) Assistance lens knob: Used to inspect various view functions.
(11) Spherical degree scale: Scale to read off spherical degree.
(12) Spherical dial: Enables to set the spherical lens with 0.25D step.
(13) Spherical knob: Enables to set the spherical lens with 3.00D step.
(14) Cylinder degree scale: Displays the astigmatic degree.
(15) Astigmatic lens knob: Enables to set the astigmatic lens with 0.25D step.
(16) Astigmatic axis knob: Used to adjust the astigmatic lens axis.
(17) Astigmatic axis scale: Displays the axis angle of the astigmatic lens axis.
(18) Cross cylinder: Used to check precise astigmatic degree, astigmatic axis, presbyopia straightening and distant spherical surface degree.
(19) Inversion knob: Used to change the axis and degree of the cross cylinder.
(20) Astigmatic axis assistance scale: Reference scale for the astigmatic lens axis.
(22) Forehead support knob: Used to adjust the forehead position back and forth.
(24) Cornea sight window: Enables to see the position of cornea of an examinee.
(26) Convergence lever: Enables the main body to be congested.
(27) Near point range finder fixation screw: Used to fix the near point range finder.
(28) Near point range finder attaching part: Attachment for the near point range finder.





【Back-side】

(21) Eye inspection window: This is a window to observe an examinee.
Each displayed lens is set in this position.

(23) Forehead support: Used to support the forehead of an examinee.

(25) Cheek stopper attachment: Attachment to fix the associated cheek stopper.

(29) Near point card: Accessory for inspecting near-point.

(30) Card holder: Holder to fix the near point card.

(31) Cheek support: Used to support cheeks of an examinee.

(32) Auxiliary lenses: Enable to change its measuring range and lens feeding step.
(C-2.00D, C-0.12D)

3. Usage

(1) Setting

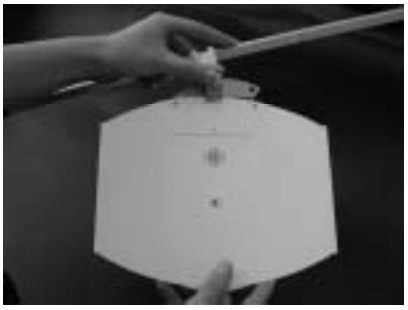
(A) Installation to eye inspection stand

(B) Horizontal control

Turn the horizontal control knob (4) so that air bubble in the standard part (5) comes to the *mark.

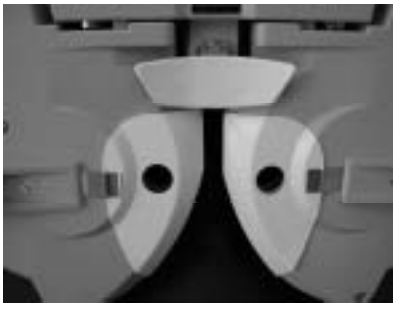
(C) Set of near point card

Insert the card holder (30) in the tip of near point range finder. Since near point range finder is divided into tow at the middle point, set the display surfaces (inch displays) of them together. The card folder slides and moves on near point range finder. Insert near point card (29) into the spring which is stuck on the card folder like (fig.5). Next, insert a near point range finder in near point range finder attachment part (28) and fix with near point range finder fixation screw (27). Incidentally, when not using, stand it like (fig.6).



(fig.5)

(fig.6)



(fig.7)

（D) Set of cheek support

Put cheek support in cheek support (25) like (fig.7), and insert and fix it on the frame of eye inspection window (21).

(2). Spherical lens

When setting only the spherical degree (writing with S below), set assistance lens knob (10) to 0 or 0_, and turn astigmatic lens knob (15) so that scale of astigmatic number (14) displays .00. When turning spherical lens dial (12) in this condition, it is possible to set the interval of -19.00 -0.00 -+16.75D in spherical degree scale (11) to 0.25D scale with the diopter (written as D below) display to set a lens. Since it is displayed with 3 digits or 4 digits of the figure, when 025 is displayed, read as 0.25D and when 1125 is displayed, read as 11.25D.

To make the degree of the lens change faster, turn spherical lens knob (13) to change S every 3.00D.

(fig.8)

(fig.9)

(3). Astigmatic lens

When astigmatic lens knob (15) is turned, 0.00-6.00D are set in the 0.25-D scale and the astigmatic degree (written as C below) is displayed in astigmatic scale (14). See (fig.10).

Incidentally because the astigmatic lens of this instrument adopts a cloud fog expression regulation eye method (the P11 reference), all negatives are adopted.

A needed astigmatic axis (astigmatic lens axis) is set when turning astigmatic axis knob (16) and adjusting an index to astigmatic axis scale (17). See (fig.12).

(fig.10)

(fig.11)

(4). Accessory lens

When it is not possible to measure astigmatic degree only with the cylinder lens (Max.6D) which was incorporated into the body, insert the auxiliary lens C-2.00(32) which is included in assistance lens box in regulation eye window (21) so that it is possible to spread a measuring range. (Up to Max. 8D)

Incidentally, at that time, surely set the pin which is stuck on the back of auxiliary lens C-2.00(32) in the pinhole which is inside astigmatic axis assistance scale (20). (When a pin is shifted, the error may occur to the astigmatic degree and the angle.)

Also, when wanting to set an astigmatic degree at smaller step then 0.25D step, set auxiliary lens C-0.12 (32) as above-mentioned, so that it is possible to measure at 0.12D step.

(5). Auxiliary lens

When assistance lens knob (10) is turned and a printed display symbol is adjusted to the index, the assistance lens to use is set in eye inspection window (21).
See (fig.12) and (fig.13).

(fig.12)

(fig.13)

O , O : The eye inspection window becomes transparent.
(OPEN)

R : The spherical lens of +1.5D (for 67cm) for retinoscope is included.
(RETINOSCOPE)

P : A polarization filter. Used for the polarization test such as inclination, eye balance and the stereopsia.
(POLARIZING FILTER)

RMV : Red Maddox is perpendicularly stored.
(RED MADDOX ROD IN VERTICAL) R side

RMH : Red Maddox is horizontally stored.
(RED MADDOX ROD IN HORIZONTAL) R side

WMV : Transparent Maddox is perpendicularly stored.
(WHITE MADDOX ROD IN VERTICAL) L side

WMH : Transparent Maddox is horizontally stored.
(WHITE MADDOX ROD IN HORIZONTAL) L side

RL : A red filter is included.
(RED FILTER) R side

GL : A green filter is included.
(GREEN FILTER) L side

+.12 : It is a +0.12D spherical lens. It is possible to set spherical degree with 0.12scale.
(+.12D SPHERICAL LENS).

PH : The pinholes with diameter of 1mm are open. This is used to judge the decline of the eyesight is because of the ametropia or another cause.
(PIN HOLE)

10△I : It is used for inspection of the perpendicular inclination with the prism of 10△ Base in (inside of the base).
L side (10D PRISM BASE IN)

6△U : Used for inspection of the horizontal inclination and so on with the prism of 6△ Base up (top of the base).
R side (6 D PRISM BASE UP)

+/-.50 : Cross cylinder of +/- 0.50D in which positive axis is included, used for presbyopia test.

OC : Used for sheltering
(OCCLUDER)

(6). Cross cylinder

Used for precise measurement of the astigmatic degree and the astigmatic axis, and presbyopia straightening and distance spherical surface degree.

When setting crossing cylinder (18) at the regulation eye window, have and do the crossing cylinder. See (fig.15).

(fig.14)

(fig.15)

The central axis of inversion knob shows axis (Axis), the letter of P shows degree (Power). Also, the white point of the inner frame is displaying the position of the positive axis and the red point is displaying the position of the negative axis.

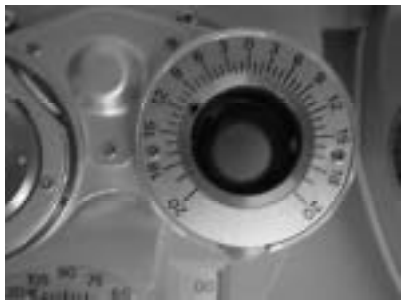
The axial direction and the degree are changed by turning the outer frame. It is possible to switch a positive axis and a negative axis by turning inversion knob (19).

Incidentally, the cross cylinder of +/- 0.37D and +/- 0.50D are available as an option.

(7). Rotating prism

Like（fig.16）, turn the rotating prism (8) with the arm part outside the prism to set to regulation eye window (21). See (fig.16) and (fig.17).

(fig.16)



(fig.17)

Turn prism revolving knob (9) in (fig.17) to change prism degree.

Since prism degree in the (fig.17) is 0, which means transparent.

In (fig.18), since 0 of the prism degree scale is above and the pointer of the prism shows 3, it means inside 3 prism base (3△BI).

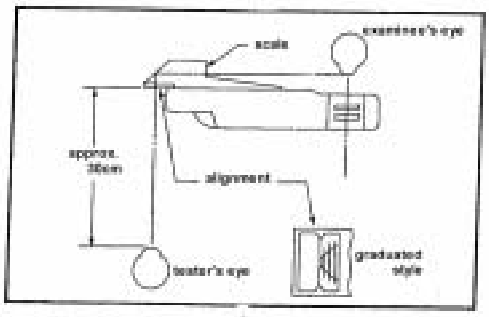
In (fig.19), when whole equipment is turned with outside knurled part of rotating prism from above-mentioned state, the direction of the prism base changes and shows (3△BU) on top of 3 prism base. (However, fig.18 and fig.19 are for the right eye.)

(fig.18)

(fig.19)

(8). Cornea sight equipment

(fig.20)



(fig.21)

When forehead support knob (22) is turned, forehead support (23) goes forward and backward. When peeping into the cornea sight window (24) about 30 cm before the window, while examinee place the forehead against forehead support (23), a sight and a scale are observed like (fig.21). Look into the examinee's eyes (the cornea surface) while adjusting the sight and length of the scale. If the position of the eyes is on the length line, eye inspection data which was measured in this condition becomes the degree of the spectacle lens which comes to 12 positions from the cornea surface. Also, the short line is 2 intervals from the length line. If the cornea surface is on the 2nd short line from the length line, it means that a spectacle lens degree is measured on the position of (4mm) 12+4=16mm. When the measurement distance is different from the distance for the glasses wearing, it is necessary to revise in accordance with table 1 or 2.

Example 1:

When it is measured at distance on 4mm (2nd short line) from the length line, if the formula is S+8.00D, look at the part intersecting place of column +8.00D and column 4 in table 1, which shows 0.26.

That is, the revision value is +0.26D. Lens degree is (+8.00) + (+0.26) =8.26D at 12cm from the eyes.

Also, it is necessary to round off the numerical value after the revision to 0.25D or 0.12d step because of manufacture of the spectacle lens.

There, in this case, it becomes +8.25 D.

Example 2:

When it is measured at distance on 3mm (middle of the 1st and short line) from the length line, if the formula is S-10.50D, look at the part intersecting place of column -10.00D and column -11.00D in table and obtain middle value of revision value:

(0.29+0.35)/2=0.32

This numerical value is revision value.

Therefore, lens degree is (-10.50) + (+0.32) =-10.18D at 12cm from the eyes.

Example 3:

When it is measured at distance on 6mm (3rd short line) from the length line, if the formula is S-14.00D, look at the part intersecting place of column -14.00D and column 6 in table 2, which shows 1.08D.

Therefore, lens degree at 12cm from the eyes:

(-14.00) + (+1.08) =-12D

The astigmatic degree is:

(-14.00) + (-6.00) =-20D

In intersecting place of column -20.00D and column 6 is 2.14 of a revision value. Therefore, lens degree at 12mm from the eyes is:

(-20.00) + (2.14) =-17D

Therefore, they are S-12.92D and C-4.94D.

Incidentally, for a reference, when the measurement degree or the difference in measurement distance and wearing distance is odd, calculate an adjusting value, using the following formula.

$$D' = D +/- (L \times D \times D) / (1000 - L \times D)$$

D: Measurement degree (D)

D': Adjusting value (D)

L: Difference in measurement distance and wearing distance (mm)

1	2	3	4	5	6	7	8	9	10
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.01
0.004	0.008	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04
0.009	0.02	0.03	0.04	0.05	0.06	0.06	0.07	0.08	0.09
0.02	0.03	0.05	0.07	0.08	0.10	0.12	0.13	0.15	0.17
0.03	0.05	0.08	0.10	0.13	0.15	0.18	0.21	0.24	0.26
0.04	0.07	0.11	0.15	0.19	0.22	0.26	0.30	0.34	0.38
0.05	0.10	0.15	0.20	0.25	0.31	0.36	0.42	0.47	0.53
0.06	0.13	0.20	0.26	0.33	0.40	0.47	0.55	0.62	0.70
0.08	0.16	0.25	0.34	0.42	0.51	0.61	0.70	0.79	0.89
0.10	0.20	0.31	0.42	0.53	0.64	0.75	0.87	0.99	1.11
0.12	0.25	0.38	0.51	0.64	0.78	0.92	1.06	1.21	1.36
0.15	0.30	0.45	0.61	0.77	0.93	1.10	1.27	1.45	1.64
0.17	0.35	0.53	0.71	0.90	1.10	1.30	1.51	1.72	1.94
0.20	0.40	0.61	0.83	1.05	1.28	1.52	1.77	2.02	2.28
0.23	0.46	0.71	0.96	1.22	1.48	1.76	2.05	2.34	2.65
0.26	0.53	0.81	1.09	1.39	1.70	2.02	2.35	2.69	3.05
0.29	0.60	0.91	1.24	1.58	1.93	2.30	2.68	3.07	3.48
0.33	0.57	1.03	1.40	1.78	2.18	2.59	3.03	3.48	3.95
0.37	0.75	1.15	1.56	1.99	2.44	2.91	3.41	3.92	4.46
0.41	0.83	1.28	1.74	2.22	2.73	3.26	3.81	4.39	5.00

Table 1 Revision value table (When the measurement frequency is +)

Table 2 Revision value table (When the measurement frequency is —)

\	1	2	3	4	5	6	7	8	9	10
−1.00	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.01
−2.00	0.004	0.008	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04
−3.00	0.009	0.20	0.30	0.40	0.40	0.50	0.60	0.70	0.80	0.90
−4.00	0.20	0.30	0.50	0.60	0.80	0.90	0.11	0.12	0.14	0.15
−5.00	0.02	0.05	0.07	0.10	0.12	0.15	0.17	0.19	0.22	0.24
−6.00	0.04	0.07	0.11	0.14	0.17	0.21	0.24	0.27	0.31	0.34
−7.00	0.05	0.10	0.14	0.19	0.24	0.28	0.33	0.37	0.41	0.46
−8.00	0.06	0.13	0.19	0.25	0.31	0.37	0.42	0.48	0.54	0.59
−9.00	0.08	0.16	0.24	0.31	0.39	0.46	0.53	0.60	0.67	0.74
−10.00	0.10	0.20	0.29	0.38	0.48	0.57	0.65	0.74	0.83	0.91
−11.00	0.12	0.24	0.35	0.46	0.57	0.68	0.79	0.89	0.99	1.09
−12.00	0.14	0.28	0.42	0.55	0.68	0.81	0.93	1.05	1.17	1.29
−13.00	0.17	0.33	0.49	0.64	0.79	0.94	1.08	1.22	1.36	1.50
−14.00	0.19	0.38	0.56	0.74	0.92	1.08	1.25	1.41	1.57	1.72
−15.00	0.22	0.44	0.65	0.85	1.05	1.24	1.43	1.61	1.78	1.96
−16.00	0.25	0.50	0.73	0.96	1.19	1.40	1.61	1.82	2.01	2.21
−17.00	0.28	0.56	0.82	1.08	1.33	1.57	1.81	2.04	2.26	2.47
−18.00	0.32	0.63	0.92	1.21	1.49	1.75	2.01	2.27	2.51	2.75
−19.00	0.35	0.70	1.02	1.34	1.65	1.94	2.23	2.51	2.77	3.03
−20.00	0.39	0.77	1.13	1.48	1.82	2.14	2.46	2.76	3.05	3.33

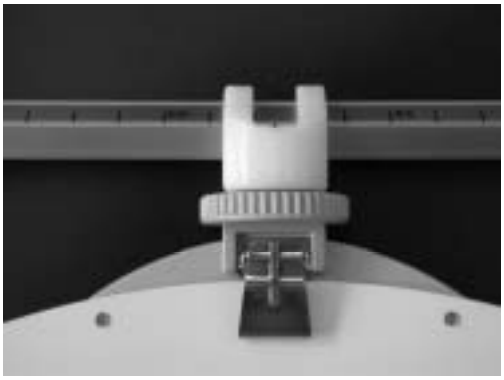
(9). Near point card

Measure a glass degree at the short distance in addition to the distant view for the person of the presbyopia of multi-focus lens wearing and so on. For the way of setting of the near point range finder, near point card (29), and card holder (30), refers to above-mentioned 3-(1)-(C) in page 5. Lay it down so that near point finder stops from the position in (fig.6) like (fig.22). If the near point range finder becomes horizontal at this position, it is a measurement position.

The scale of the near point range finder is cm (15-70) scale, inch (5-28) scale, and Dptr. (8-1.5) scale. Incidentally, near point range finder is cut in two for convenience in the package and in safekeeping.

To set, adjust a pin and a ditch in the connection part so that the above-mentioned each scale continues. The numerical value which agreed with the both edge line of the card folder like (fig.23) shows a distance from the eyes to the card.

(fig.22)



(fig.23)

Next, choose a view token according to the eye inspection contents from the near point card which clings to the card folder. The set of the view token, when a reel in the lower part of the card is turned with the finger, it appears at the view token window.

View token number display window

(fig.24)

Also, when concentration lever (26) on either side is turned inside, as the principal axis of the lens turns to 30 c, this receptacle itself is concentrated and an ideal short distance test can be made. (See fig.25)

(fig.25)

4. Eye inspection method

The eye inspection method which is possible to do with this receptacle is explained. Before eye inspection with this receptacle, it is necessary to investigate in advance present eyesight and condition of examinee, record of eyes, P.D measurement, near point of being overcrowded and shelter test. We recommend mastering a basic eye inspection method to manage this receptacle effectively.

Then, we assume one model and describe for convenience of explanation.

"30 age adult Mr. A with glasses came to the shop."

*The reason for coming to the shop is "eyesight lack".

*The degree of the glasses used at present is examined with a lens-meter:

P.D: 64

R: S-1.00D*C-0.50D A90*

L: S-1.25D*C-0.50D A180*

That is,

Pupil distance: 64

Right eye: Spherical degree -1D,
astigmatic degree -0.50D, axis 90*

Left eye: Spherical degree -1D,
astigmatic degree 0.50D, axis 180*

Both eyes were 0.7 when eyesight is inspected with wearing these glasses. Besides, if finding that the investigation before using this receptacle use (the questioning and so on) finishes, that there is no fear of the eye disease, that a right view function is accomplished and that the decline of the eyesight is because of the ametropia, measure the proper glass degree with this receptacle.

(1). Setting

(A) Install this receptacle in the eye inspection stand almost horizontally.
Next install near point range finder in the fix part (28) and makes it facing above like (fig.6).

(B) Set the spherical degree (shown as S below) of both eyes and an astigmatic degree (shown as C below) to zero.

(C) Set the pupil distance (P.D.) which had been measured in advance with the PD meter in this receptacle. To set them, turn P.D. scale (6) agrees with P.D. of "Mr. A".

(D) Turn the face of Mr. A to the back (fig.2) of this receptacle and make him set his forehead on forehead support (23).

(E) Which seeing level vial (5), put air bubble on the index of the * make by turning horizontal control knob (4) and obtain horizontal of this receptacle.

(F) Set a distance between the corner vertex and this receptacle.

(G) Measurement is started from the right eye. Set 0_ or 0 for the right eye with assistance lens (10) and OC for the left eye.

(2) Eye inspection by cloud fog method

(A) Add degree S which is +3.00D bigger than the expected right eye. Since the present glass degree is -1.00D, put (-1.00) + (+3.00) =+2.00D.That is, make it 200 of the white figure.

(B) The eyesight became much worse than the beginning such that it can almost see the index of 0.1 (To increase S by +3.00D than the expected degree is to fall the eyesight until it is possible to see index of 0.1 barely.) Then, to let out eyesight gradually is cloud fog method. Generally, it is often adopted as the good regulation eye method which has few control power. To exclude control power there, make the examinee relax eyes for a while.

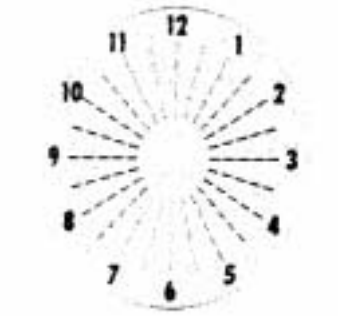
Next, decrease S step by step with spherical lens dial (12), like 2.00, to 1.75, to 1.50. Lower it until the eyesight becomes about 0.5.

Suppose that -1.00 (100 of the red) was displayed.

(C) Show the eyesight table or astigmatic table of chart projector and ask the examinee how he can see. Mr. A replied “like (fig.26)”. Turn the astigmatic axis knob (16) to adjust the line which is clearly seen cross to the astigmatic axis.

See (fig.27).

If the whole is not clearly seen uniformly, there is no astigmatic so that operations of 4-(2)-(C), (D) and 4-(3) are unnecessary.



(fig.26)

(fig.27)

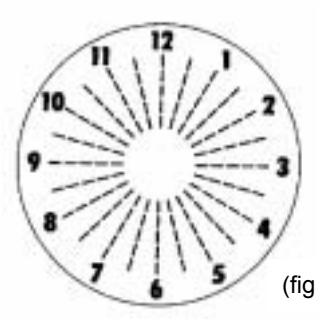
(D) Turn astigmatic knob (15) and increase the value C from /00, to .25 so that any line can be seen uniformly.

Now, it became .50 and it becomes an average like (fig.28).

(E) Change S by 0.25 until the eyesight value becomes best.

1.00-> 1.25 -> 1.50 --- Write down the eyesight then.

-1.00D	0.7	-1.75D	1.5
-1.25D	0.9	-2.00D	1.5
-1.50D	1.2	-2.25D	1.5



(fig.28)

Set the optimal spectacle lens with the smallest degree with which gets best eyesight for nearsightedness. In case of the hypermetropia, set it with the biggest degree. For Mr. A it is -1D because of nearsightedness. Now, the outline measurement of the right eye was ended. Then, measure them precisely.

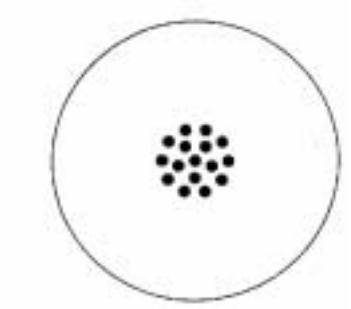
(3) Precise measurement of astigmatic axis, astigmatic degree.

(A) Set cross cylinder (18) in front of the right eye. When the outer frame of the cross cylinder is turned, the axis and the degree changes. (fig.29) Adjust the revolving axial direction in the astigmatic axial direction.


(fig.29)

(When it is agreed to the astigmatic axial direction, it clicks and fits to the ditch and it is possible to confirm fitting.)

(B) Make an eyesight token point group-chart (fig.30). Roll inversion knob (19) with the finger and reverse the lens. Make the examinee compare the look of (fig.30) at that time. Stop inversion on the surface which it is possible to see better and it was like (fig.31). Observing the surface at that time, shift it by 5 degree to the direction of the red point. (Make it 95 degree)




(fig.30) (fig.31)

(C) Reverse the lens again and make it compare the look. The answer was that the state like (fig.32) was good again. Shift is by 5 degree to the direction of the red point. (It becomes 100 degree)


(fig.32)

(D) Reverse the lens once again. Mr. A is considering the judgment which is better. The fact that it is difficult to judge or when both are the almost same means that correct astigmatic lens axis is decided. (Axis was fixed to 100 degree.)

(E) Measure precise astigmatic degree (C) next.

Turn the outer frame of cross cylinder lens (18) and adjust letter P to the astigmatic axial direction. (fig.33)

(fig.33)

(F) Using (fig.30) as eyesight token like before, turn the cross cylinder (18) like (B) and make the examinee compare the look.

The answer was that the state of (fig.34) was easily seen as a result of the comparison.

As for a surface in this case, the red point is on the position of P so that increase (C) by 0.25D. (Mr. A's C is 0.75D.)

(fig.34)

(G) Reverse the lens again and make him compare the look. Next time, the answer was that the surface of (fig.35) was better to see.

As for a surface in this case, the white point is on the position of P so that decrease (C) by 0.25D.

(Mr. A's C is 0.50D.)

(fig.35)

If the red point is on the position of P, add it by 0.25D. Therefore, 0.50D was added along with (F). In such a case, he will feel S by C/2, i.e. only 0.25D.

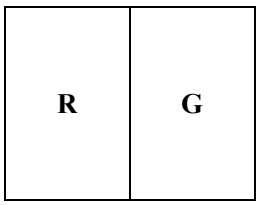
(H) When the lens is turned again, the answer was the state of (fig.34) was better.

Since this is the same surface as (F), it is to increase C by 0.25D, but this is to be 0.75D again. According to this, 0.05D is weak but 0.75D is too strong. The precise C is -0.62D.

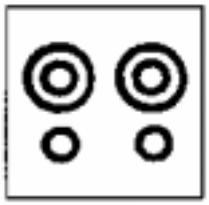
However, since it requires a special order to get this lens, which will be expensive. Generally, use -0.50D. Which is weaker?

(4) Precise measurement of spherical degree (Red degree test)

(A) Examinee precise S next. Use a red green view token as an eyesight table.
Show (fig.36) or (fig.37) and confirm which of red view token can be seen well.
The answer was “that the green one is a little better”. In this case, it means that nearsighted degree is slightly strong (a little weak in case of hypermetropia).
Then, add S by -0.25D.
It becomes -1.75D -> 1.50D.



(fig.36)


(fig.37)

(B) Ask which of red or green can be seen well. Next time, the answer was red was a little better. When the side or the red is better, it means that the degree of the nearsightedness is a little weak (a little strong in case of being hypermetropia).
Then, it has returned before when gaining S by 0.25D.
Therefore, Mr. A’s S is -1.62 which is between -1.50D and -1.75D.
Since this lens is a special order, generally, use the -1.50D which is weaker (a little strong lens for hypermetropia).

(C) Now, the measurement of the right eye has been completed. Let’s try clearing a lens degree.
S (spherical degree) is 1.50 of the red figure.
C (spherical degree) is 0.50 of the red figure and the axis is 100 degree.

This means:

R: S-1.50D*C-0.50D A 100 degree

Next is the measurement of lens left eye. Turn assistance lens knob (10), set the left eye 0_ or 0and set the right eye OC.

Like the right eye, carry out “the cloud fog method” and “Red/Green test” in order.

The left eye of Mr. A was:

L: S-2.00D*C-0.50D A 170 degree

Now, the measurement of the right eye and the left eyes has ended.

Since eyes were measured one by one, carry out the balance test for both eyes next.

(5) Eye balance tests

(i) Way of using polarization filter

(A) First, set both eyes P by turning assistance lens knob (10).
On the other hand, project eye balance view tokens (fig.38) of the chart projector as a view token.

(Fig.38)

(B) Mr. A can see the line above in (fig.38) with the right eye and can see a line below with the left eye.
If it is possible to read up to the same place for the upper and lower line, both eyes are balance.
When it isn't possible to read up to the same place, add +0.25 to the eye which cannot be seen better as S. Since Mr. can see view token below better, add +0.25D to S of the left eye here.
Mr. A's left eye is:

L: S-1.75D*C-0.50D A 170 degree

(C) Add S by +1.00D for both eyes next.
The lens degree of Mr. A at this time is:

R: S-0.50D*C-0.50D A 100 degree
L: S-0.75D*C-0.50D A 170 degree

(D) Add S by -0.25 gradually both eyes at the same until the expected eyesight of both eyes is attained. As a result:

R: S-1.25D*C-0.50D A 100 degree
L: S-1.50D*C-0.50D A 170 degree

(ii) Way of using rotating prism

(A) Set both eyes 0_ or 0 first. For view token, use a view token of one side line generally. Set rotating prism (8) in both eyes and put the prismatic of 2△BD (left eye).

(fig.39)

(B) Then, Mr. A can see a view token of one side line as up and down. Ask which can be seemed clearly. He says it is possible to see the eyes which can see clearly. When it is possible to see the top well, add S by +0.25 to the eyes with which a prism base is lower, i.e. the left eye which have 2△BD.

(C) The same as (C) in (i)

(D) The same as (D) in (ii)

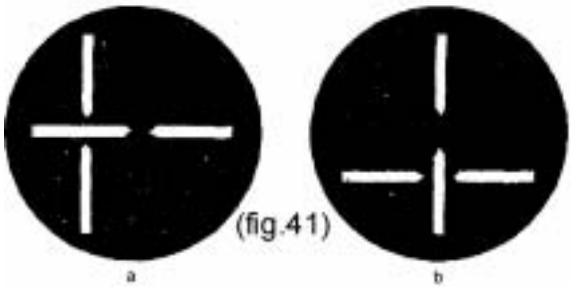
(6) Inclination (long distance) measurement

(i) Way of using polarization (long distance) measurement

(A) Turn the assistance lens knob (10) to set both eyes P. On the other hand, project inclination view token (fig.40) with the chart projector or the trial eyesight table as a view token.

(B) When an examinee has no inclination, four lines line up like a cross like (fig.40). If there is inclination, this relational position is not properly seen. (fig.40)

(fig.40)



(fig.41)

a b

(C) When only a vertical line is shifted like (fig.41) a, set a rotating prism (8) to the left eye and make 0 (zero) scale above. Turn prism revolving knob (9) quietly so that it can be seen as in (fig.40). (Upper and lower inclination)

(D) When both of vertical and horizontal lines are shifted line in (fig.42), separate the horizontal and vertical line to consider and correct them separately.

First, make 0 (zero) scale of the rotating prism set in the left eye top, turn rotating prism knob (9) for the left eye and read the scale when the vertical line becomes the center of the horizontal line like in the (fig.41b). (Horizontal inclination) Next, make 0 (zero) scale side, turn rotating prism knob (9) and read the scale when becoming the center of the vertical line like in (fig.41a).(Perpendicular inclination)

(ii) Way of using Maddox rod and rotating prism

(fig.42)

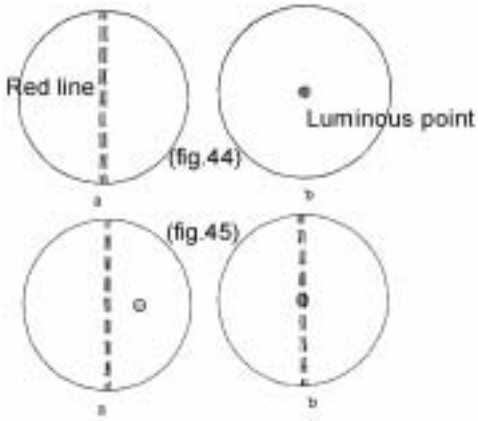
(A) Measure horizontal inclination first. Do it in the condition results of (5) (B) (iv) result in the previous clause are entered. Adjust the assistance lens knob (10) of the right eye to RMH like in (fig.43).

Make rotating prism (8) with 0 (zero) scale top and set it for the left eye. And then, light up a mini-bulb (mini-lamp) in the position of the view token up to now. Mr. A can see read vertical (fig.44a) with the right eye and luminous points (fig.44b) with the left eye and either can be seen like in (fig.45a) or (fig.45b).

The luminous point moves to the right and left sides by turning rotating prism knob (9). And then, make him give a sing when it becomes like in (fig.45b).

As a result, it was like in (fig.46). The scale of the rotating prism is adjusted to 2 which is in from 0. This is 2△BI so that measurement was 2* outer inclination.

(fig.43)



(fig.46)

(B) Next, measure perpendicular (top and bottom) inclination. Adjust the assistance lens knob (10) of the right eye to RMV like in (fig.47). For the rotating prism (8) of the left eye, make 0 scale horizontal. Mr. A can see red side line with the right eye and luminous point with the left eye. Like in (i), turn the rotating prism knob (9) and make him give a sign when the red line and the luminous point agree. The sign was given in the condition of (fig.48). The scale is 0/5 under 0. This means that the left eye is 0.5△BD, that is, 0.5△ top inclination and the right eye is 0.5△ bottom inclination.

(Fig.47)

(Fig.48)

(7) Sorting of measurement result

Now, Mr. A's eyesight measurement has ended. If there is much inclination (6) (A) and (6) (B), it is necessary to correct with glass, however, there is no necessity for Mr. A. Therefore, P.D.:64

Make a glass with:

R: S-1.25D* C-0.50D A 100 degree

L: S-1/50D* C-0.50D A 170 degree

(8) Measurement of presbyopia

(A) It is a so-called test to fix degree of spectacles for the aged, implemented for more than about 45-age person. Farsighted glass degree is surely measured and it is started with the degree put in the eye inspection window.

First, like in the procedure of "3. (8) near point card of usage", fix the near point range finder fix part (28) and near point range finder tightly with near point range finder fixation screw (27). Lower the near point range finder horizontally quietly next.

(B) Adjust assistance lens knob (10) of both eyes +/-.50.

(C) Place the near point card (29) at the distance which the examinee hopes for with its view token number (cross mark) of (fig.5) facing to the examinee. Ask the look of vertical line and a horizontal line. In case of the presbyopia eyes, it is possible to see the horizontal line more clearly surely, however, and a vertical line can be seen vaguely.

When it is possible to see well both of horizontal and vertical lines, there is no need for spectacles for the aged.

(B) Until it is possible to see the vertical lines more clearly than the horizontal line or the same as the vertical line, gain S by 0.25D to the direction of the positive at the same time for both eyes. Reduce by only 0.25D if the examinee is less than 45 ages, and keep it if not.

(C) Change +/-.50 of both eyes into 0_or 0. Turn the rotating part of the near card, set the view token number (1) or (6), and show small character and make him compare the look. S is sometimes a little adjusted. Above, the measurement of the presbyopia ended. Observing the display scale of this receptacle, record the measurement result.

(9) Inclination at the short distance

(i) Horizontal inclination

Put the result of farsighted measurement in the eye inspection window of both eyes in case of a person who is not presbyopia. Put the result of farsighted measurement in the eye inspection window of both eyes in case of a person who is not presbyopia. Put the result of nearsighted measurement in case of a person of the presbyopia. Put a near card at the 40cm distance (near distance) and show view token number 3. Adjust the assistance lens knob (10) of the right eye to 6*BU so that letter line is perfectly separated upper and lower. It will be like in (fig.49) incase of horizontal inclination. In the case, set rotating prism (8) in the other eye, and turn up 0 scales line in (fig.51).

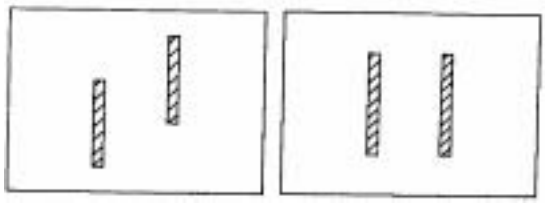
Turn prism revolving knob (9) so that there is no dislocation between the left and right like in (fig.50). Then, the scale of the rotating prism degree of horizontal inclination.

(fig.49) (fig.50)

(fig.51)

(ii) Perpendicular inclination

Set the view token number of the near card 8. Set the assistance lens knob (10) of the left eye 10*BI so that the letter line is perfectly separated to the sides. It will be like in (fig.52) in case of perpendicular inclination. In the case, set a rotating prism in the other eye and move 0 scales to the side like in (fig.54). Turn prism revolving knob (9) so that there is no dislocation of top and bottom like in (fig.53). Then, the scale of the rotating prism shows the prism degree of perpendicular inclination.



(fig.52) (fig.53)

(fig.54)

(10) Other measurement

(i) Concentration and disperse

Put a rotating prism in front of both eyes and place 0 scales above. To measure a concentration to far point (5m), turn the rotating prism of both eyes at the same time to the outside of the base, and read a value when the target of length letter in the eyesight table and so on can be seen in two for the first time (where double sight occurs for the first time).This shows the concentration ability for both eyes. Only with the rotating prism, it is possible to measure up to 40△ (about 22 degree) concentration.

Oppositely, to measure disperse, move the rotating prism of both eyes at the same time to the inside of the base and read the scale when the target can be seen as double sight. With the rotating prism, it is possible to do measurement up to 40△. With 10△BI of the assistance lens board, it is possible to do measurement up to 50△ in total.

It is possible to do the measurement of concentration and disperse at the short distance if installing the view token number 8 of the near point card in near range finder. It demands a limit point where letter does not cause double sight while turning a sight while turning a rotating prism and the method is the same as the time of the far point.

(ii) Perpendicular disperse

Set rotating prism (8) in front of both eyes and set 0 scale horizontally. Use the side letter of the eyesight table for far point (5m) and the view token number 8 of the near card for the near point.

Turn prism revolving knob (9) and read a scale when the letter of the side line can be seen as in two for the first time (where double sight occurs for the first time). This becomes the value of perpendicular disperse.

(11) Degree conversion

This receptacle (M-AEI sight tester) is mainly designed for the eyesight measurement method by the cloud fog method. It doesn't need a positive cylindrical lens, which is not even equipped. However, in case of hypermetropia astigmatic and so on, generally, with refractometer, in case of the spectacle lens and so on, a cylindrical lens is displayed in positive so that it is necessary to convert the degree.

SX D*CY D AZ degree

-> S(X+Y)D*C(-Y)D A(Z+/-90) degree

This is the formula of the degree conversion. That is:

S: Adds a cylindrical lens degree to the spherical lens degree.

C: Add mark (+/-) of cylindrical lens degree.

A: Adds 90 degree when Z is smaller than 90 degree.

Decrease 90 degree when Z is bigger than 90 degree.

(ex.) In case of S+3.00D*C-1.00D A175 degree

S: (3.00) + (-1.00) =+2.00

C: (-1.00) =+1.00

A: 175 degree – 90 degree = 85 degree

Therefore, S+2.00D*C+1.00D A 85 degree

Also, in opposite case, for example, it is necessary to convert the degree when value of some positive eye which is measured with refract meter is put in M-AE1, too.

(ex.) If S+0.50D*C+0.75D A 85 degree

S: (+0.50) + (0.75) =+1.25

C: - (+0.75) =-0.75

A: 85 degree + 90 degree =175 degree

Therefore, put S+1.25D*C-0.75D A 175 degree

5. Maintenance and check

(1) Daily maintenance

(A) While not using, place dust COVER.

(B) Avoid a place where there is much dust and so on for a storage place.

(C) When the lens gets dirty, add a little of mix liquids of 4 ether 1 alcohol in worn cotton cloth and wipe out the dirt. In case of the lens in the body, wipe out in above mentioned method from the eye inspection window directly on the side of the inspector or the side of the examinee.

(D) The receptacle is a precise instrument. A lot of functions are incorporated in a small space. Be careful sufficiently in dealing not to damage the functions.

When a problem occurs to the operation and so on, tell immediately the nearest agency and our office for a repair.

(2) Check

There is no part which needs a check specially, however, when then the temperature is very low, operation of each knob and handle sometimes gets rather heavy in the relation of the lubricant used. However, it is recovered with the rise of temperature and it isn't a trouble.

Also, it will be desirable to preliminary operation for checking before eye inspection every morning. It is recommended to do disassembly cleaning three or four times per year, depending on the use and storage conditions.